

CLAIMS

1. A method of obtaining a subject's physiological history from a sample analysis, the method comprising the steps of:

- 5 (a) measuring an amount of a cellular modification for each of a plurality of cells from a biological sample;
- (b) sorting the cell measurements from step (a) as a function of the amount of modification; and,
- (c) determining a physiological history for the subject by analyzing the ordered cell measurements.

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2. The method of claim 1, wherein the physiological history is indicative of a disease or disorder in the subject.

3. The method of claim 2, wherein the disease or disorder is diabetes.

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4. The method of claim 3, wherein the diabetes is Type I diabetes.

5. The method of claim 3, wherein the diabetes is Type II diabetes.

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6. The method of claim 3, wherein the diabetes is gestational diabetes.

7. The method of claim 2, wherein the disease or disorder is a thyroid disease or disorder.

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8. The method of claim 7, wherein the thyroid disease or disorder is selected from the group consisting of hypothyroidism, hyperthyroidism, euthyroid sick syndrome, Graves disease, juvenile hypothyroidism, and thyroid cancer.

9. The method of claim 1, wherein the biological sample is a blood sample.

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10. The method of claim 1, wherein the cellular modification is hemoglobin glycation.

11. The method of claim 1, wherein the physiological history is determined
5 by comparing a cell distribution profile or a portion thereof with one or more reference distribution profiles.

12. The method of claim 1, wherein the physiological history is determined using an algorithm comprising the steps of:

10 (i) calculating a change in the amount of modification for each of a series of time intervals represented by the cell distribution profile or a portion thereof; and,
(ii) determining the physiological history of the patient during the series of time intervals based on the calculated change in the amount of modification.

13. The method of claim 1, further comprising the step of using the
15 physiological history to provide a diagnosis for the subject.

14. The method of claim 1, further comprising the step of using the
physiological history to provide a prognosis for the subject.

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15. The method of claim 1, wherein each of the plurality of cells is isolated before the amount of cellular modification is measured for that cell.

16. The method of claim 1, wherein each of the plurality of cells is isolated
25 based on the amount of cellular modification in that cell.

17. The method of claim 11, wherein the cell distribution profile is obtained using a procedure selected from the group consisting of chromatography, electrophoresis, mass spectrometry, and cell sorting.

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18. A method of obtaining a cell distribution profile of a patient, the method comprising the steps of:

- (a) obtaining a biological sample comprising intact cells;
- (b) isolating a plurality of intact cells from the biological sample;
- 5 (c) measuring an amount of a physiological variable in each of the isolated cells; and,
- (d) determining a cell distribution profile based on the measured amounts of the variable in the isolated cells.

10 19. A method of obtaining a cell distribution profile of a patient, the method comprising the steps of:

- (a) obtaining a biological sample comprising intact cells; and
- (b) determining a cell distribution profile for a plurality of the intact cells using a procedure that sorts the intact cells based on an amount of a physiological
- 15 variable in each of the sorted cells.

20. The method of claim 18 or 19, wherein said profile is a continuous profile.

21. The method of claim 18 or 19, wherein said profile is a discrete profile.

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22. The method of claim 18 or 19, wherein the physiological variable is the amount of glycated hemoglobin in each cell.

23. The method of claim 19, wherein the plurality of intact cells are separated using a procedure selected from the group consisting of chromatography, electrophoresis, mass spectrometry, and cell sorting.

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24. The method of claim 18 or 19, wherein the biological sample is a blood sample.

25. A method for recovering the blood glucose level history of a patient diagnosed with diabetes, the method comprising the steps of:

- (a) obtaining a blood sample comprising intact cells
- (b) obtaining a cell distribution profile by sorting a plurality of the intact cells
5 based on the amount of glycated hemoglobin in each cell; and,
- (c) determining the patient's glucose level history based on the cell
distribution profile.

26. The method of claim 25, wherein the patient's blood glucose level history
10 is obtained by comparing the patient's cell distribution profile to one or more
reference profiles.

27. The method of claim 25, wherein the patient's blood glucose level history
is obtained using an algorithm.

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28. The method of claim 27, wherein the algorithm corrects for non-linearity
in the rate of hemoglobin glycation.

29. The method of claim 27, wherein the algorithm uses patient specific input
20 data.

30. The method of claim 29, wherein the patient specific input data is selected
from the group consisting of the patient's age, gender, and weight.

25 31. The method of claim 27, wherein the algorithm uses a value for the
average life span of a red blood cell.

32. The method of claim 25, wherein the intact cells are sorted using a
procedure selected from the group consisting of chromatography, electrophoresis,
30 mass spectrometry, and cell sorting.

33. The method of claim 25, comprising the additional step of determining whether the patient has Type I, Type II, or gestational diabetes.

34. The method of claim 25, comprising the additional step of determining a
5 treatment regimen for the patient.

35. The method of claim 25, comprising the step of obtaining a second blood sample at a second time and performing steps (b) and (c) on the second blood sample.

10 36. The method of claim 25, wherein the glycosylated hemoglobin is labeled.

37. A chromatography device for separating blood cells based on levels of glycosylated hemoglobin, the device comprising:

- 15 (a) a high pressure column comprising a sample chamber and a tapered exit hole;
- (b) a dynamic light scattering detector connected to the exit hole; and,
- (c) a gas powered injector connected to the sample chamber.

38. An electrophoretic device for separating blood cells based on levels of
20 glycosylated hemoglobin, the device comprising:

- (a) a liquid flow column with a sample entry point and a plurality of collection points along the length of the column; and,
- (b) an electromagnetic field generator associated with the column, wherein the electromagnetic field is normal to the direction of the liquid flow.

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